Performance and Economic Analysis of Calf-Fed and Yearling Systems for Fall-Weaned Calves

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Story in Brief

The objectives of this study were to evaluate feedlot performance, carcass characteristics and production economics of fall-weaned calves either placed directly on feed (calf-fed or allowed to graze wheat pasture before entering the feedlot (yearlings). In this study, yearlings were 229 lb heavier at harvest and hot carcass weight was 150 lb heavier vs calf-feds. During the finishing phase, average daily gain was 12% greater, but feed efficiency was lower for yearlings vs calf-feds. Dressing percentage and ribeye area were greater for yearling cattle. Yield grade, % KPH, and overall marbling score were not different among the two systems. Profitability on a live cattle market tended to be greater for calf-feds, and there was a greater breakeven selling price for these cattle compared with yearlings. On a grid market, carcass base price was greater for calf-feds, but when subject to either a yield or a quality grid, there was no difference between the two systems. These results indicated that the incorporation of long-term winter wheat grazing resulted in a 22% increase in hot carcass weight with little impact on carcass quality or profitability when sold on a live or grid marketing basis.

Key Words: Beef Cattle, Economics, Production Systems

Introduction

Previous research with calf-fed and yearling systems clearly shows that feedlot average daily gain is greater for yearling cattle, while feedlot feed efficiency is more favorable for calf-fed cattle (Lunt and Orme, 1987; Gill et al., 1993a; Anderson et al., 2005). Published literature provides inconsistent results relative to the impact of management system on carcass characteristics. For example, Hickok et al. (1992) and Gill et al. (1993b) each reported no differences in yield grade or quality grade among calf-fed and yearling steers, while greater marbling scores for calf-fed steers vs yearling steers were observed by Brewer et al. (2007) and Anderson et al. (2005). In the southern Great Plains, wheat pasture is commonly utilized during the growing phase of the yearling system. Therefore, the objectives of our study were to evaluate feedlot performance, carcass characteristics and economic feasibility of fall-weaned calves either sent directly to the feedlot as calves or grazed on wheat pasture prior to feedlot entry as yearlings.

Materials and Methods

Animals. All experimental procedures were approved by the Oklahoma State University Animal Care and Use Committee. Calf-fed steers (n=84; 489 lb initial BW) of similar initial weight were randomly allotted to pens (n=16) at the Willard Sparks Beef Cattle Research Center. Calves were managed in pens until reaching approximately .5 in 12th rib fat thickness as determined by visual evaluation. Steers in the yearling system (n=60; 488 lb of initial BW) first grazed winter wheat at the Oklahoma State University Wheat Pasture Unit located 4 miles west of Stillwater. Wheat pasture grazing was initiated on Nov. 11, 2004 and Nov. 14, 2005. Steers

were removed from wheat pasture on April 26 of each year, resulting in 166- and 163-d grazing periods in 2004-05 and 2005-06, respectively. Following the wheat pasture grazing period, steers were transported to the Willard Sparks Beef Cattle Research Center for the duration of the feeding period. Upon arrival to feedlot, yearlings (n=60; 980 lb of initial BW) were weighed and randomly assigned to pens (n=12) of similar initial weight. Yearling steers were managed in pens until reaching approximately .5 in 12th-rib fat thickness as determined by visual evaluation.

Prior to weaning, all steers were vaccinated for IBR, BVD, PI3, and BRSV and administered a 7-way clostridial and pasturella vaccine. At weaning, steers were given a booster of the respiratory vaccine and in year 1, steers were de-wormed with Dectomax® (Pfizer Animal Health, Exton, PA), and in year 2 were de-wormed with IVOMEC® Plus (Merial Ltd., Duluth, GA). Prior to wheat pasture turn-out or feedlot entry, in yr 1, steers were implanted with Duralease™ Suspension Implant (Merial Ltd., Duluth, GA). In yr 2, steers were initially implanted with Synovex-S (Fort Dodge Animal Health, Fort Dodge, IA). Calf-fed steers were re-implanted with Revalor-S® (Intervet, Millsboro, DE) after 84 d on feed, and yearlings were re-implanted with Revalor-S® upon feedlot arrival. Steers in the two systems, across both years, were fed a dry-rolled corn-based diet offered ad libitum.

At the completion of the study, steers were weighed and a 4% pencil shrink was applied to determine final weight. In both years, cattle were harvested at Tyson Fresh Meats, Emporia, KS. Harvest date for calf-fed steers was approximately May 1st each year and July 20th for yearlings. Carcass data including 12th-rib fat thickness; 12th-rib longissimus muscle area; kidney, pelvic, and heart (KPH) fat; marbling score and quality grade was obtained following a 24-h chill period. Data was collected by Kansas State University Meat Science personnel.

Economics. A ten-year economic analysis (1996-2005), of both live and grid pricing systems, was conducted to assess post-weaning economics among calf-fed and yearling production programs. Breakeven selling price and system profit or loss were calculated when cattle were priced live. Grid pricing included an evaluation of both quality and yield-based marketing programs.

To compute the value of cattle on a live basis, calf purchase price was calculated using the weighted average price for calves sold during the second week of November. These prices were obtained from the USDA for feeder cattle in Oklahoma (USDA, 2007). The price paid for yearlings entering the feedlot corresponded to the calculated breakeven selling price of yearlings at the time of feedlot entry. Live selling price of finished cattle was obtained from average Oklahoma-Texas-New Mexico prices reported by the USDA (USDA, 2007) and represented the approximate week of slaughter of each of the two systems. This corresponded to the first week in May for calf-fed steers and the third week of July for yearlings. The 2-yr mean, derived from our biological data for initial weight, final weight, ADG and dry matter intake (DMI) was held constant each year. Ration costs were determined from the average monthly price of corn using Cattle-Fax reports for the period in which cattle were on feed (Cattle-Fax, 2006). Interest rates were determined by average prime interest rates for the time that cattle were on feed using Cattle-Fax data (Cattle-Fax, 2006). The following values were held constant across all 10 yr within respective system and are typical of costs in the stocker and cattle feeding industry in this region: death loss=2.0% for calf-feds and calves on wheat pasture and 1.0% for yearlings in the

feedlot, freight was assessed at $3.00/loaded mile, medical cost= $12.00/hd for calf-fed, $10.00/hd for calves during wheat pasture phase and $7.50 for yearlings in the feedlot, labor for cattle on wheat pasture=$0.07/hd daily, yardage=$0.35/d, and beef check-off=$1.00. Across the 2 yr, steers grazed wheat for an average of 165 d; wheat pasture was charged at $0.32 per lb of gain and total wheat pasture gain averaged 491 lb.

Grid prices, including appropriate premiums and discounts, were obtained from respective slaughter dates for calf-feds and yearlings from the years of 1996-2005 from USDA-AMS reports (USDA, 2007). Biological data from our experiment, including quality grade, yield grade, hot carcass weight, and discounted carcasses, were held constant across the 10-yr analysis for assessment of associated premiums and discounts. Carcass base price and value on each respective grid were determined by the methodology of Ward (2002). Net profit in each grid was computed by subtracting system cost per head from the respective carcass value.

Statistical Analysis. Data for performance, carcass characteristics and economics were analyzed using the MIXED procedure of SAS for Windows release 8.1 (SAS Inst. Inc., Cary, NC). For analysis of feedlot performance and carcass data, pen served as the experimental unit and the model included the effect of management system. For data of economic analysis, management system served as a fixed effect and year was included as a random variable. In all analyses, year was included as a random variable. Treatment means were computed using the LSMEANS option. When the P-value for the F-statistic was $\leq .05$, least squares means were separated using the LSD procedure of SAS ($\alpha=.05$).

Results and Discussion

Performance. Across the 2-yr duration of this trial, ADG for steers grazing wheat pasture was 2.97 lb/d, corresponding to total wheat pasture gain of 492 lb (data not shown). Mortality was 0% during this period. Yearling steers were 491 and 227 lb heavier than calf-fed steers at feedlot entry and harvest, respectively, compared with calf-fed steers ($P<.01$) (Table 1). Yearling steers had 12% greater feedlot ADG, 39% greater DMI, and 20% poorer gain to feed compared with calf-fed steers ($P<.01$) (Table 1). Mortality was 3.4% for calf-feds and 0% for yearlings in the finishing phase.

Carcass Characteristics. Yearling carcasses were 151 lb heavier than carcasses from calf-fed steers ($P<.01$). No heavy weight carcass or carcass maturity discounts were applied. Dressing percentage and ribeye area was greater for yearling steers vs calf-fed steers ($P<.01$), yet there was no difference in 12th rib fat, % KPH, calculated USDA yield grade or marbling score among the two growing systems ($P>.10$). Although there was no significant difference in marbling score due to system, there was a greater percentage of yearling cattle that graded choice and a greater percentage of those cattle were in the upper 2/3 of the choice grade (Table 2).

Previous research that has reported greater marbling score values for calf-fed vs yearling cattle utilized British x Continental cattle and forage other than wheat pasture for the yearling backgrounding phase (Anderson et al., 2005; Brewer et al., 2007). The results from our study may be influenced largely by the fact that the cattle were moderately framed and of an Angus based genotype.

Economic Analysis. On average, finished cattle price was $4.74/CWT greater in April for the calf-fed system compared to finished cattle price in July for the yearling system. The ten-year economic analysis revealed a $1.56/CWT greater breakeven selling price for the calf-fed system vs the yearling system (P<.01). Nevertheless, there was a trend (P=.09) for system profitability to favor calf-feds over yearlings (Table 3), due primarily to greater seasonal fed cattle price and improved feed efficiency in the calf-fed system.

Similarly, typical seasonal price patterns resulted in carcass base price being greater (P=.02) for calf-feds compared to yearlings. When appropriate premiums and discounts were evaluated on a quality grid, carcass value was greater for yearlings over calf-feds (P<.01), but net profit for this grid was not different among the two systems (P>.10). Likewise, on a yield grid, carcass value favored yearlings over calf-feds (P<.01), and net profit was not different across the two systems (P>.10) (Table 4).

Our 10-yr economic analysis was conducted using actual corn prices during a period that can be characterized as one in which corn was relatively inexpensive. In fact, corn price averaged $2.15 per bushel for the period, whereas presently, from January 2007 through June 2007, the price for corn has averaged $3.69 per bushel. If the current trend for corn prices persists then there will be greater potential for profitability in the yearling system as higher corn prices generally increases the value of gain for cattle on pasture. Across the 10-yr that were analyzed, the average corn price never reached that of today and figure 1 depicts the relationship between corn price and system profitability over the past 10 yr. However, if the demand for corn usage in ethanol production continues to grow, corn price may be an even stronger driving factor in the profitability of calf-fed versus the yearling systems in the future.

Table 1. The effect of growing/finishing system management on steer feedlot performance				
ITEM	SYSTEM			
	Calf-fed	Yearling	SEM	P-value
No. pens	16	12	--	--
No. animals	84	60	--	--
Initial weight, lb	489	980	18.52	<.01
Final weight, lb[a]	1110	1339	24.41	<.01
Total feedlot gain, lb	621	359	16.04	<.01
ADG, lb	3.63	4.07	.13	.01
DMI, lb/d	19.71	27.40	.66	<.01
Days on feed	171	88	3.61	<.01
Gain:Feed	.18	.15	.01	<.01
Adj. final weight, lb[b]	1103	1337	28.35	<.01
Adj. ADG, lb	3.60	4.05	.13	.02
Adj. Gain:Feed	.19	.15	.01	<.01

[a]Shrunk weight calculated as 96% of actual weight
bAdjustment based on HCW/standard dressing percentage of 0.635

Table 2. The effect of growing/finishing system management on steer carcass characteristics				
ITEM	SYSTEM			
	Calf-fed	Yearling	SEM	P-value
Hot carcass weight, lb	700	851	17.95	<.01
Dressing percent	63	63.6	.51	<.01
Ribeye area, in^2	12.20	13.56	.23	<.01
12th-rib fat, in	.57	.57	.03	.93
KPH, %	2.18	2.10	.12	.51
USDA yield grade	3.1	3.3	.13	.19
% Yield grade 1.0[a]	1.19	0	--	.40
% Yield grade 2.0[a]	48.81	38.33	--	.21
% Yield grade 3.0[a]	42.86	46.67	--	.65
%Yield grade 4-5[a]	7.14	15	--	.12
Marbling score[*]	584	588	17.30	.84
% No-roll[a]	1.2	.00	--	.40
% Select[a]	12	11.7	--	.97
% Total choice[a]	81.0	88.3	--	.23
% Upper 2/3 choice[a]	26.0	41.7	--	.05
% Prime[a]	5.8	0	--	.05
%CAB[a**]	23.8	35.0	--	.14

[a]Data analyzed utilizing chi-square test, percentage corresponds to percent of dependent variable within system.

[*]400=slight00, 500=small00

[**] CAB = carcasses that qualify for Certified Angus Beef® marketing program.

Table 3. Economic analysis of calf-fed and yearling systems using live animal pricing				
ITEM	SYSTEM			
	Calf-fed	Yearling	SEM	P-value
Average finished cattle price, $/CWT	75.32	70.58	2.82	<.01
Breakeven selling price, $/CWT	68.19	66.63	2.88	<.01
System profit or loss, $/hd	79.41	52.94	21.51	.09

Table 4. Economic analysis of calf-fed and yearling systems using two carcass grid pricing systems				
ITEM	SYSTEM			
	Calf-fed	Yearling	SEM	P-value
Base price of carcass, $/CWT	117.94	112.17	4.46	.02
Quality grid carcass value, $/hd[a]	831.00	946.75	34.36	<.01
Quality grid net profit, $/hd[a,b]	70.39	55.71	25.71	.33
Yield grid carcass value, $/hd[a]	819.07	932.85	34.36	<.01
Yield grid net profit, $/hd[a,b]	58.46	41.81	25.42	.27

[a]Carcass value calculated as base price plus/minus premiums and discounts
bNet profit calculated as carcass value minus cattle cost and production expenses

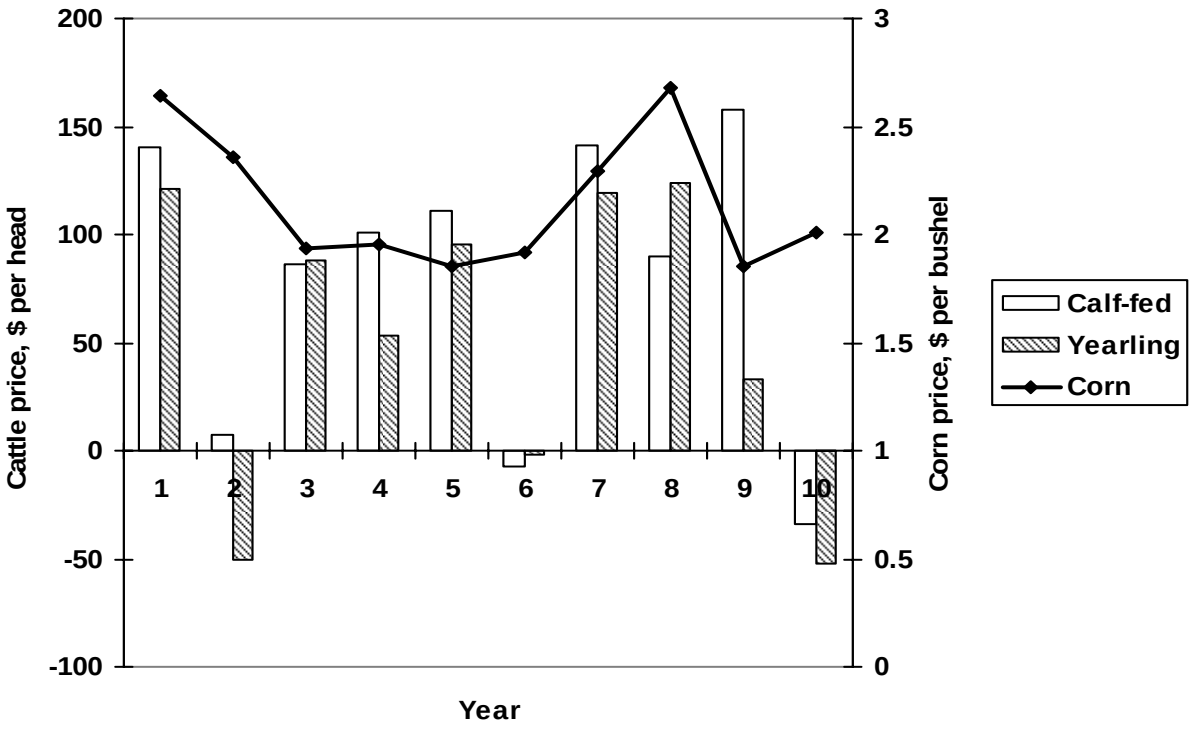

Figure 1. Corn price in relation to profit or loss for calf-fed and yearling systems over the past 10 years.

Conclusion

Similar to previous reports, we conclude that yearling cattle grazing wheat pasture for an extended period prior to feedlot entry have greater finishing period ADG and feed intake, but lower G:F compared with calf-fed steers. However, when finished to a constant 12th-rib fat thickness, there is little difference in marbling score and yield grade among the two systems. On average, both systems were profitable, although profitability was extremely volatile ranging from $-50.24 to $+158.23 dollars per head using the live pricing method. The calf-fed system was profitable 8 yr out of 10, while the yearling system was profitable 7 yr out of 10. Pricing the cattle on a carcass basis yielded similar results. As the dynamics of the cattle finishing industry change with the loss of corn to ethanol production, yearling systems may be utilized more extensively than calf-fed systems. Achieving the fewest number of days on feed, without sacrificing carcass quality, will be pivotal to maximize profit potential. While a wheat pasture grazing system increased carcass weight dramatically, carcass characteristics were not negatively affected in this study.

Literature Cited

Anderson, R.V. et al. 2005. J. Anim. Sci. 83:694-704.
Brewer, P.S. et al. 2007. J. Anim. Sci. 85:1239-1246.
Cattlefax. 2006. http//www.cattle-fax.com.
Gill, D.R. et al. 1993a. Oklahoma State University Research Report.
Gill, D.R. et al. 1993b. Oklahoma State University Research Report.

Hickok, D.T et al. 1992. Pages 64-65 in Proc. 1992 Cattleman's Day, Kansas State Univ., Manhattan.
Lunt, D. K. and L. E. Orme. 1987. Meat Science. 20:159-164.
USDA. 2007. http://www.ams.usda.goc/lsmnpubs.
Ward, C.E. 2002. OSU Agricultural Economics Dept.
http://pods.dasnr.okstate.edu/docushare/dsweb/View/Collection-236.

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